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## Determining Fertility Index Value From Soil Test Results

**Source: University of Maryland Cooperative Extension, 1996**  
**"Interconverting Among Soil Test Analyses Frequently Used in Maryland"**  
**Soil Fertility Management 4**  
**Regulatory Citation: COMAR 15.20.08.05E**

**What Do Soil Tests Measure?**

Soil testing is a useful tool that can help ensure the efficient use of applied plant nutrients. Soil tests provide a means for assessing the fertility status of a soil, but soil tests do not provide a direct measure of the actual quantity of plant available nutrients in the soil. Instead, soil tests measure the quantity of a nutrient element that is extractable from a soil by a particular chemical extracting solution. The measured quantity of extractable nutrient in a soil is then used to predict the crop yield response to application of the nutrient as fertilizer, manure, or other amendment. As soil test levels increase for a particular nutrient, the expected crop yield response to additions of that nutrient decreases.

**Why Are There So Many Different Soil Testing Procedures?**

Over the years, many different soil testing procedures and extracting solutions have been evaluated in an effort to identify the method that provides the most reliable prediction of crop yield response to nutrient application. It has been determined that some soil testing procedures are best suited for particular soil types and climatic regions while other soil testing procedures are better suited for different soil types and climates. Also, we have learned that there are often several alternative soil testing methodologies that generate equally useful predictions of expected crop response for a given region. There are several different soil testing procedures that work well for Maryland soils.

**Why Are There So Many Different Ways to Express Soil Test Results?**

The actual numerical soil test values are products of laboratory procedures that determine the concentrations of extractable plant nutrients in the soil. Thus, soil-test values are merely arbitrary index numbers and not measures of the actual quantity of plant available nutrients present in a soil. Historically in Maryland, the numerical soil test values have been converted to units of "pounds per acre" of soil test nutrient expressed as a fertilizer equivalent (e.g. P2O5, K2O). However, pounds per acre of the actual nutrient element (e.g. P, K), concentration of the nutrient element in a given volume of soil (e.g. ppm, mg/dm3), or concentration of the nutrient element in a given weight of soil (e.g. ppm) are all equally valid expressions of soil test results. The numerical soil test values are determined by units used to express the results.

An alternative method for expressing the relative level of plant available nutrients measured by soil testing uses "soil fertility index values". Soil fertility index values comprise a continuous relative scale that is calculated from the concentration of extractable nutrients measured in the laboratory, where the highest concentration within the "optimum" range is set equal to a soil fertility index value of 100. The numerical value of the soil fertility index is not affected by method of soil analysis or the units used to express the soil test results.

**Different Tests Yield Different Results**

Different soil testing laboratories use different soil testing procedures. Different soil testing procedures generate different analytical results. Different analytical results may or may not yield different crop nutrient application recommendations. Regardless of the soil testing methods utilized, the analytical results generated must be correlated to crop yield responses under local growing conditions in order to provide reliable nutrient recommendations.

**Who Is In the Soil Testing Business In Maryland?**

At one time, soil testing was almost exclusively performed by public (university or state agency)

laboratories. The University of Maryland Cooperative Extension Service Soil Testing Laboratory has been providing analyses of farmers' soils since 1954. Today, many private-sector soil testing laboratories are providing high-quality soil testing services for our agricultural community. In general, the private-sector laboratories have excellent analytical capabilities and generate reliable analytical results. However, direct application of the analytical results generated by different soil testing laboratories to the crop nutrient recommendations developed by the Maryland Cooperative Extension Service has been difficult because of the differences in the numerical values and units used in expression of analytical results.

A recent survey of certified nutrient management consultants conducted by the Maryland Department of Agriculture identified three major private-sector soil testing laboratories that are frequently used by Maryland farmers: A & L Eastern Agricultural Laboratories, Inc. (Richmond, Virginia), Brookside Laboratories, Inc. (New Knoxville, Ohio), and the Agronomic Services Laboratory of Spectrum Analytic, Inc. (Washington Court House, Ohio).

### Interconverting Among Soil Test Analyses

This publication represents the initial attempt to provide simple factors for interconverting the analytical results generated by Maryland's three major private-sector soil testing laboratories and the soil test values used by the Maryland Cooperative Extension Service. These conversion factors will permit the direct application of the crop nutrient recommendations developed in Maryland to analytical data regardless of how, where, or by whom the soil test was performed.

The conversion sequences presented in Tables 1 through 4 are intended to be simple and easy-to-use. The conversions were empirically derived from analysis of numerous Maryland agricultural soils by each of the participating soil testing laboratories. The conversion of private-sector laboratory analyses will generate reliable approximations of Maryland soil test values to which the Maryland plant nutrient recommendations may be applied.

It is very simple to convert from the old Maryland "pounds per acre" format to the new soil fertility index values. Simply follow the conversion sequences outlined in Table 1.

Conversion sequences for interconverting between soil test data generated by A&L Eastern Agricultural Laboratories, Inc., Brookside Laboratories, Inc. and the Agronomic Services Laboratory of Spectrum Analytic, Inc. and University of Maryland Soil Testing Laboratory data are given in Tables 2, 3, and 4, respectively.

### Conversions Using FERTREC PLUS 2.2

Interconversion of analytical results among the three major private-sector soil testing laboratories and Maryland's soil test values is a new feature of the University of Maryland's FERTREC PLUS 2.2 nutrient management software program. The conversion options in FERTREC PLUS 2.2 allow the direct application of laboratory data from any of these soil testing laboratories in development of plant nutrient recommendations based on Maryland research and Maryland growing conditions.

**Table 1.** Conversion sequences for interconverting between University of Maryland Cooperative Extension Service Soil Testing Laboratory "pounds per acre" of soil test nutrient and Maryland soil fertility index values.

To convert from "pounds per acre" of soil test nutrient to soil fertility index value, multiply "pounds per acre" by the value in Col. 1 and then add the value in Col. 2.	Col. 1	Col. 2	To convert from soil fertility index value to "pounds per acre" of soil test nutrient, subtract the value in Col. 2 from the soil fertility index value and then divide by the value in Col. 1.
P2O <sub>5</sub> , lbs/A, pounds per acre	0.499	(-2.327)	P fertility index value
K <sub>2</sub> O, lbs/A, pounds per acre	0.314	(-0.439)	K fertility index value
Mg, lbs/A, pounds per acre	0.382	0.271	Mg fertility index value
Ca, lbs/A, pounds per acre	0.058	0.403	Ca fertility index value

**Table 2.** Conversion sequences for interconverting between A & L Eastern Agricultural Laboratories soil test data and University of Maryland Soil Testing Laboratory soil test data.

To convert from University of Maryland soil test data to an equivalent A & L Laboratories value, multiply the Maryland soil test data by the value in Col. 1 and then add the value in Col. 2.	Col. 1	Col. 2	To convert from A & L Laboratories soil test data to an equivalent Univ. of Maryland value, subtract the value in Col. 2 from the A & L Laboratories soil test value and then divide by the value in Col. 1.
<b>University of Maryland</b>			<b>A &amp; L Laboratories</b>
P2O5, lbs/A, pounds per acre	0.333	10.823	P1 (Weak Bray), ppm
K2O, lbs/A, pounds per acre	0.476	19.195	K, ppm
Mg, lbs/A, pounds per acre	0.543	(-11.070)	Mg, ppm
Ca, lbs/A, pounds per acre	0.411	239	Ca, ppm

**Table 3.** Conversion sequences for interconverting between Brookside Laboratories soil test data and University of Maryland Soil Testing Laboratory soil test data.

To convert from University of Maryland soil test data to an equivalent Brookside Laboratories value, multiply the Maryland soil test data by the value in Col. 1 and then add the value in Col. 2.	Col. 1	Col. 2	To convert from Brookside Laboratories soil test data to an equivalent University of Maryland value, subtract the value in Col. 2 from the Brookside laboratories soil test value and then divide by the value in Col. 1.
<b>University of Maryland</b>			<b>Brookside Laboratories</b>
P2O5, lbs/A, pounds per acre	0.445	9.504	Easily Extractable P, ppm
K2O, lbs/A, pounds per acre	0.648	9.844	K, ppm
Mg, lbs/A, pounds per acre	0.6984.208	Mg, ppm	
Ca, lbs/A, pounds per acre	0.523	432	Ca, ppm

**Table 4.** Conversion sequences for interconverting between Spectrum Analytic soil test data and University of Maryland Soil Testing Laboratory soil test data.

To convert from University of Maryland soil test data to an equivalent Spectrum Analytic value, multiply the Maryland soil test data by the value in Col. 1 and then add the value in Col. 2.	Col. 1	Col. 2	To convert from Spectrum Analytic soil test data to an equivalent Univ. of Maryland value, subtract the value in Col. 2 from the Spectrum Analytic soil test value and then divide by the value in Col. 1.
<b>University of Maryland</b>			<b>Spectrum Analytic</b>
P2O5, lbs/A, pounds per acre	0.732	18.414	P, lbs/A, pounds per acre
K2O, lbs/A, pounds per acre	1.022	38.322	K, lbs/A, pounds per acre
Mg, lbs/A, pounds per acre	1.094	7.518	Mg, lbs/A, pounds per acre
Ca, lbs/A, pounds per acre	0.758	383	Ca, lbs/A, pounds per acre